REMARKS

In the Office Action, the Examiner noted that claims 1-17 are pending in the application and that claims 1-14 are rejected. The Examiner objected to claim 15 and allowed claims 16-17. By this response, claims 1-17 continue without amendment. In view of the following discussion, the Applicant submits that none of the claims now pending in the application are obvious under the provisions of 35 U.S.C. §103. Thus, the Applicant believes that all of these claims are now in condition for allowance.

I. OBJECTIONS

The Examiner has objected to dependent claim 15 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. The Applicant thanks the Examiner for indicating allowable subject matter, but believes independent claim 14, from which claim 15 depends, is allowable over the prior art of record for the reasons set forth below. Thus, the Applicant contends that claim 15 should distinguish over the prior art of record since claim 15 depends from independent claim 14. Therefore, the Applicant respectfully requests that the objection to claim 15 be withdrawn.

II. REJECTION OF CLAIMS UNDER 35 U.S.C. §103

The Examiner rejected claims 1-14 as being unpatentable over Harrison (United States patent 6,151,353, issued November 21, 2000) in view of Nussbaum (United States patent 5,952,947, issued September 14, 1999). The rejection is respectfully traversed.

A. Claims 1-12

The Examiner conceded that Harrison does not teach a decimation circuit for producing subsampled signals from GPS signal samples, and a quantizer for producing quantized samples. (Office Action, p. 2). The Examiner stated, however, that Nussbaum teaches a decimation circuit and a quantizer. (Office Action, p. 2). The Examiner concluded that it would have been obvious to one skilled in the art to modify Harrison to include the decimation circuit and quantizer of Nussbaum to improve the

accuracy and speed of signal processing. (Office Action, p. 2). The Applicant respectfully disagrees.

Harrison generally describes a GPS receiver. (See Harrison, Abstract). With reference to FIG. 3, Harrison discloses an RF/IF tuner section (21) having an antenna (211), an RF amplifier (212), a mixer (213), a local oscillator (214), and a low pass filter (215). The low pass filter (215) provides a down-converted signal (i.e., an analog signal) to an analog-to-digital (A/D) converter (22). The A/D converter (22) samples the down-converted signal and supplies digital signal samples to a correlator (23). (Harrison, col. 9, lines 8-20; FIG. 3). The aspects of FIG. 3 described above are identical for each embodiment of GPS receiver disclosed in Harrison (Harrison, FIGs. 4 and 5).

Nussbaum generally describes a delta-sigma analog signal converter. (See Nussbaum, Abstract). In particular, Nussbaum teaches a delta-signal modulator for sampling and quantizing an input signal to a single bit. (Nussbaum, col. 3, lines 7-8). Nussbaum further teaches a digital decimation filter that digitally filters the signal output from the delta-sigma modulator. (Nussbaum, col. 3, lines 18-21).

The cited references, either singly or in any permissible combination, do not teach, suggest, or otherwise render obvious Applicant's invention as recited in claim 1. Namely, the combination of Harrison and Nussbaum fails to teach or suggest a quantizer for producing quantized samples from subsampled signals, where the subsampled signals are produced by a decimation circuit in response to digital samples of received GPS signals.

Specifically, Applicant's claim 1 positively recites:

"A receiver of global positioning system (GPS) signals comprising:

a decimation circuit for producing a subsampled in-phase (I) signal and a subsampled quadrature (Q) signal from digital samples of received GPS signals;

a quantizer for producing quantized I and Q samples from the subsampled I and Q signals;

a convolution processor for producing I and Q correlations." (Emphasis added).

In Applicant's invention, the decimation circuit processes digital samples of received GPS signals to produce subsampled signals, and the quantizer processes the

subsampled signals to produce quantized samples. In other words, the quantizer processes the output of the decimation circuit.

First, Nussbaum does not teach or suggest quantizing samples output from the decimation circuit. Rather, Nussbaum teaches a decimation circuit for filtering and down-sampling the 1-bit quantized samples produced by the delta-sigma modulator. Nussbaum is devoid of any teaching or suggestion of quantizing the samples output by the decimation circuit. That is, Nussbaum fails to teach or suggest a quantizer between the decimation filter and the video filters to which the decimation filter is coupled. As such, Nussbaum does not teach or suggest <u>quantizing subsampled I and Q signals produced by a decimation circuit</u>, as recited in the Applicant's claim 1.

Second, Harrison is devoid of any teaching or suggestion of quantizing subsampled I and Q signals produced by a decimation circuit. Since neither Harrison nor Nussbaum teach or suggest quantizing subsampled I and Q signals produced by a decimation circuit, no conceivable combination of Harrison and Nussbaum renders obvious Applicant's invention recited in claim 1. Therefore, the Applicant contends that claim 1 is patentable over the combination of Harrison and Nussbaum and, as such, fully satisfies the requirements of 35 U.S.C. §103.

Amended claim 7 recites a method of receiving GPS signals having features similar to the features of claim 1 emphasized above. Thus, for the same reasons cited above, the Applicant contends that claim 7 is patentable over the combination of Harrison and Nussbaum and fully satisfies the requirements of 35 U.S.C. §103. Finally, claims 2-6 and 8-12 depend, either directly or indirectly, from claims 1 and 7 and recite additional features therefor. Since Harrison and Nussbaum do not render obvious the Applicant's invention as recited in claims 1 and 7, dependent claims 2-6 and 8-12 are also nonobvious and are allowable.

B. Claims 13-14

The Examiner conceded that Harrison does not teach reducing bit precision. (Office Action, p. 3). The Examiner stated, however, that a divider for reducing the number of bits of precision of I and Q correlations to produce quantized I and Q correlations would have been obvious to one skilled the art, since "there is a trade off in

representing the signals using [more bits] and the complexity of the circuit." (Office Action, p. 3). The Applicant respectfully disagrees.

The cited references, either singly or in any permissible combination, do not teach, suggest, or otherwise render obvious Applicant's invention as recited in claim 13. Namely, neither Harrison nor the combination of Harrison with Nussbaum teaches or suggests a divider for reducing the number of bits of precision of I and Q correlations produced by a convolution processor. Specifically, Applicant's claim 13 positively recites:

> "A receiver of global positioning system (GPS) signals comprising:
> a decimation circuit for producing a subsampled in-phase (I) signal and a subsampled quadrature (Q) signal from received GPS signals;
> a convolution processor for producing I and Q correlations;
> a divider for reducing the number of bits of precision of the I and Q correlations to produce quantized I and Q correlations;
> a signal normalizer for normalizing the quantized I and Q correlations to produce complex magnitude values; and
> a magnitude accumulator for summing the complex magnitude values."
> (Emphasis added).

In contrast, Harrison is devoid of any teaching or suggestion of employing a divider after the digital correlator for reducing the number of bits of precision in the correlations. Rather, in Harrison, the correlation results are directly coupled to the squarer (element 29 in FIGs. 3-5). While Harrison discusses the tradeoffs between memory requirements and signal-to-noise ratio with respect to use of a 1-bit and 2-bit A/D converter in the front end (col. 11, lines 30-55), Harrison is devoid of any discussion regarding a component for reducing the precision of correlation results produced by the digital correlator (element 23 in FIGs. 3-4). In particular, Harrison does not teach or suggest a divider as recited in the Applicant's claim 13.

Nussbaum is devoid of any teaching or suggestion of a divider for reducing the number of bits of precision. Since neither Harrison nor Nussbaum teach or suggest a divider for reducing the number of bits of precision of I and Q correlations produced by a convolution processor, no conceivable combination of Harrison and Nussbaum teach or suggest Applicant's invention recited in claim 13. Therefore, the Applicant contends that claim 13 is patentable over Harrison and Nussbaum and, as such, fully satisfies the requirements of 35 U.S.C. §103(a).

Furthermore, the cited references, either singly or in any permissible combination, do not teach, suggest, or otherwise render obvious the Applicant's invention as recited in claim 14. Namely, neither Harrison nor the combination of Harrison with Nussbaum teaches or suggests a magnitude approximation circuit for normalizing correlations generated by the convolution processor to produce complex magnitude values. Specifically, the Applicant's claim 14 positively recites:

> "A receiver of global positioning system (GPS) signals comprising:
> a decimation circuit for producing a subsampled in-phase (I) signal and a subsampled quadrature (Q) signal from received GPS signals;
> a convolution processor for producing I and Q correlations;
> a magnitude approximation circuit for normalizing the I and Q correlations to produce complex magnitude values; and
> a magnitude accumulator for summing the complex magnitude values."
> (Emphasis added).

In contrast, Harrison employs a squarer (element 29, FIGs. 3-5) that computes the square of a correlation result, rather than an approximation of the square of a correlation result. Harrison is devoid of any teaching or suggestion of employing a circuit or component for approximating the magnitude or square of correlation results produced by the digital correlator. As such, Harrison does not teach or suggest a magnitude approximation circuit as recited in the Applicant's claim 14.

Nussbaum is devoid of any teaching or suggestion of a magnitude approximation circuit. Since neither Harrison nor Nussbaum teach or suggest a magnitude approximation circuit for normalizing correlations generated by the convolution processor to produce complex magnitude values, no conceivable combination of Harrison and Nussbaum renders obvious Applicant's invention recited in claim 14. Therefore, the Applicant contends that claim 14 is patentable over Harrison and Nussbaum and, as such, fully satisfies the requirements under 35 U.S.C. §103.

III. ALLOWED CLAIMS

The Applicant thanks the Examiner for indicating that claims 16-17 are allowable.

CONCLUSION

Thus, the Applicant submits that none of the claims presently in the application are obvious under the provisions of 35 U.S.C. § 103. Consequently, the Applicant believes that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring any adverse final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Robert M. Brush, Esq. or Mr. Raymond R. Moser, Jr., Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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